

Amendments to the Claims

Please cancel Claim 23. The Claim Listing below will replace all prior versions of the claims in the application.

1-15 (Cancelled)

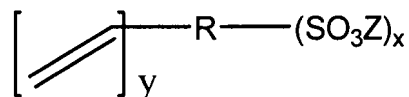
16. (Previously Presented) A proton-conducting electrolyte membrane obtained by a process comprising the steps of:

- a) swelling a polymer film with a liquid comprising a vinyl-containing sulphonic acid, and
- b) polymerizing the vinyl-containing sulphonic acid present in the liquid introduced in step a).

17. (Previously Presented) The membrane of Claim 16, characterized in that the film used in step a) exhibits swelling of at least 3% in the liquid comprising a vinyl-containing sulphonic acid.

18. (Previously Presented) The membrane of Claim 16, characterized in that the polymers used in step a) are polymers that are stable at high temperatures and contain at least one nitrogen, oxygen, or sulphur atom in one or more repeat units.

19. (Previously Presented) The membrane of Claim 16, characterized in that the liquid comprising a vinyl-containing sulphonic acid contains compounds of the formula



wherein

R represents a bond, a C1-C15 alkyl group, a C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which

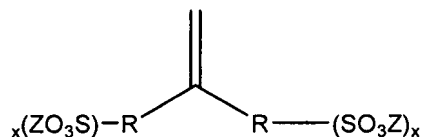
the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, or NZ₂,

Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and

x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

y represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

or the formula



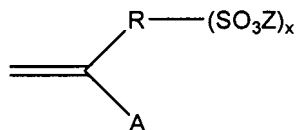
wherein

R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,

Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and

x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

or the formula



wherein

A represents a group of the formulae COOR^2 , CN , CONR_2^2 , OR^2 and/or R^2 , wherein R^2 represents hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or

heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,

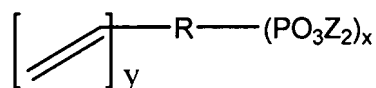
R represents a bond, a divalent C1-C15 alkylene group, divalent C1-C15 alkyleneoxy group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,

Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and

x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

20. (Previously Presented) The membrane of Claim 16, characterized in that the liquid comprising a vinyl-containing sulphonic acid contains phosphonic acid.

21. (Previously Presented) The membrane of Claim 20, characterized in that the liquid comprising a vinyl-containing sulphonic acid contains compounds of the formula



wherein

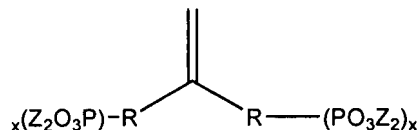
R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,

Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and

x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

y represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

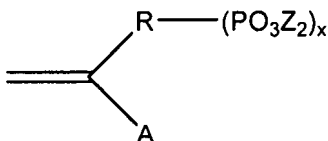
or of the formula



wherein

- R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,
- Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and
- x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

or of the formula



wherein

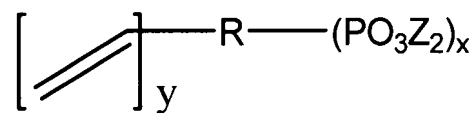
- A represents a group of the formulae COOR², CN, CONR²₂, OR² or R², wherein R² represents hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,
- R represents a bond, a divalent C1-C15 alkylene group, divalent C1-C15 alkyleneoxy group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,
- Z represents, independently of one another, hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20

aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and

x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

22. (Previously Presented) The membrane of Claim 20, characterized in that the ratio by weight of vinyl-containing phosphonic acid to vinyl-containing sulphonic acid lies in the range of 1:100 to 99:1.
23. (Cancelled)
24. (Previously Presented) The membrane of Claim 16, characterized in that the liquid comprising a vinyl-containing sulphonic acid contains at least one substance capable of forming radicals.
25. (Previously Presented) The membrane of Claim 16, characterized in that the polymerization in step b) is carried out by irradiation with IR or NIR light, UV-light, β , γ and/or electron rays.
26. (Previously Presented) The method of Claim 16, characterized in that the membrane has inherent conductivity of at least 0.001 S/cm.
27. (Previously Presented) The membrane of Claim 16, characterized in that the membrane contains between 1 and 90 % by weight of the polymer and between 99 and 0.5 % by weight of polyvinyl sulphonic acid.
28. (Previously Presented) The membrane of Claim 16, characterized in that the membrane comprises a layer containing a catalytically active component.

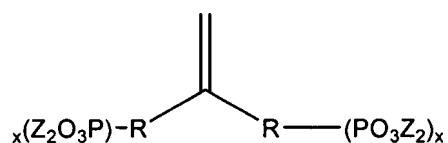
29. (Previously Presented) The membrane of Claim 16, characterized in that the liquid comprising a vinyl-containing sulphonic acid contains phosphonic acid and compounds of the formula



wherein

- R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,
- Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and
- x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10
- y represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

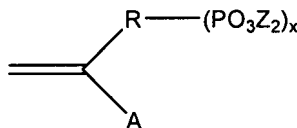
or of the formula



wherein

- R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,
- Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and
- x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

or of the formula



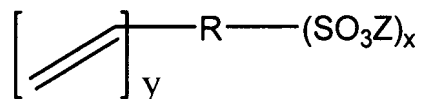
wherein

- A represents a group of the formulae COOR^2 , CN , CONR_2^2 , OR^2 or R^2 , wherein R^2 represents hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, $-\text{OH}$, COOZ , $-\text{CN}$, NZ_2 ,
- R represents a bond, a divalent C1-C15 alkylene group, divalent C1-C15 alkyleneoxy group, in which the aforementioned radicals are optionally substituted by halogen, $-\text{OH}$, COOZ , $-\text{CN}$, NZ_2 ,
- Z represents, independently of one another, hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, $-\text{OH}$, $-\text{CN}$, and
- x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10; and

the ratio by weight of vinyl-containing phosphonic acid to vinyl-containing sulphonic acid lies in the range of 1:100 to 99:1.

30. (Previously Presented) A membrane electrode unit containing at least one electrode and at least one proton-conducting electrolyte membrane obtained by a process comprising the steps of:
 - a) swelling a polymer film with a liquid comprising a vinyl-containing sulphonic acid, and
 - b) polymerizing the vinyl-containing sulphonic acid present in the liquid introduced in step a).

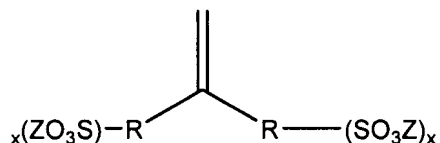
31. (Previously Presented) The unit of Claim 30, characterized in that the liquid comprising a vinyl-containing sulphonic acid contains compounds of the formula



wherein

- R represents a bond, a C1-C15 alkyl group, a C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, or NZ₂,
- Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and
- x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10
- y represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

or the formula

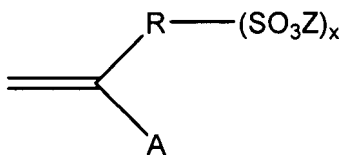


wherein

- R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,
- Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and
- x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

or the formula

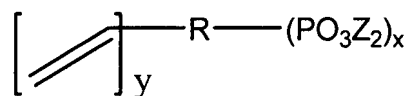
- 10 -



wherein

- A represents a group of the formulae COOR^2 , CN , CONR^2_2 , OR^2 and/or R^2 , wherein R^2 represents hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, $-\text{OH}$, COOZ , $-\text{CN}$, NZ_2 ,
- R represents a bond, a divalent C1-C15 alkylene group, divalent C1-C15 alkyleneoxy group, in which the aforementioned radicals are optionally substituted by halogen, $-\text{OH}$, COOZ , $-\text{CN}$, NZ_2 ,
- Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, $-\text{OH}$, $-\text{CN}$, and
- x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

32. (Previously Presented) The membrane of Claim 30, characterized in that the liquid comprising a vinyl-containing sulphonic acid contains compounds of the formula



wherein

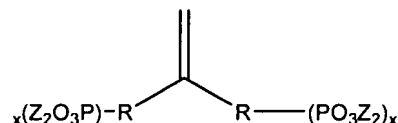
- R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, $-\text{OH}$, COOZ , $-\text{CN}$, NZ_2 ,
- Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or

heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and

x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

y represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

or of the formula



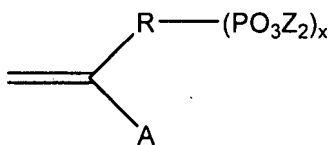
wherein

R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,

Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and

x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

or of the formula

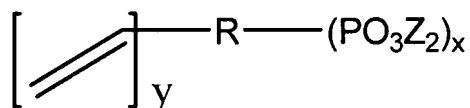


wherein

A represents a group of the formulae COOR², CN, CONR²₂, OR² or R², wherein R² represents hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,

- R represents a bond, a divalent C1-C15 alkylene group, divalent C1-C15 alkyleneoxy group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,
- Z represents, independently of one another, hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and
- x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

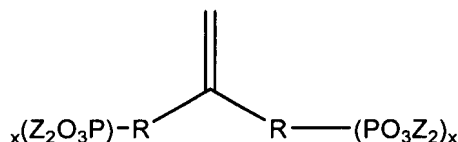
33. (Previously Presented) The unit of Claim 30, characterized in that the liquid comprising a vinyl-containing sulphonic acid contains phosphonic acid and compounds of the formula



wherein

- R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,
- Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and
- x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10
- y represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

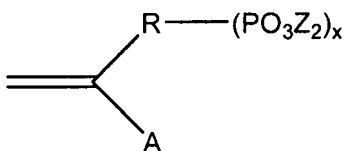
or of the formula



wherein

- R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,
- Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and
- x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

or of the formula

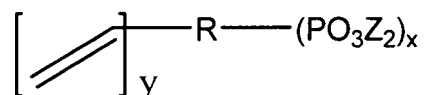


wherein

- A represents a group of the formulae COOR², CN, CONR²₂, OR² or R², wherein R² represents hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,
- R represents a bond, a divalent C1-C15 alkylene group, divalent C1-C15 alkyleneoxy group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,
- Z represents, independently of one another, hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and
- x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10; and

the ratio by weight of vinyl-containing phosphonic acid to vinyl-containing sulphonic acid lies in the range of 1:100 to 99:1.

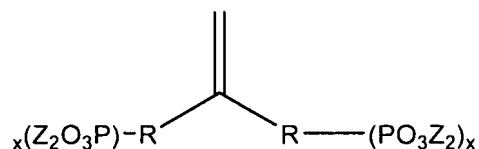
34. (Previously Presented) A fuel cell containing one or more membrane electrode units containing at least one electrode and at least one proton-conducting electrolyte membrane obtained by a process comprising the steps of:
- swelling a polymer film with a liquid comprising a vinyl-containing sulphonic acid, and
 - polymerizing the vinyl-containing sulphonic acid present in the liquid introduced in step a).
35. (Previously Presented) The fuel cell of Claim 34, characterized in that the liquid comprising a vinyl-containing sulphonic acid contains phosphonic acid and compounds of the formula



wherein

- R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,
- Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and
- x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10
- y represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

or of the formula



wherein

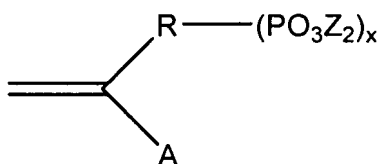
R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,

Z represents, independently of one another, hydrogen, C1-C15 alkyl group,

C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and

x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

or of the formula



wherein

A represents a group of the formulae COOR², CN, CONR²₂, OR² or R², wherein R² represents hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,

R represents a bond, a divalent C1-C15 alkylene group, divalent C1-C15 alkyleneoxy group, in which the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN, NZ₂,

Z represents, independently of one another, hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and

x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10; and

the ratio by weight of vinyl-containing phosphonic acid to vinyl-containing sulphonic acid lies in the range of 1:100 to 99:1.